

BAA 01-09

Micro Power Generation

Proposer Information Pamphlet

- SECTION I: Proposer Information
- SECTION II: Broad Agency Announcement (BAA)
BAA 01-09, Micro Power Generation
- SECTION III: Defense Advanced Research Projects
Agency/ Microsystems Technology Office
(DARPA/MTO)

COORDINATING POC:

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Dear **BAA 01-09** Proposer Information Requester:

The **BAA 01-09** Proposer Information Pamphlet is enclosed in response to your request. This pamphlet is divided into three sections.

SECTION I: Proposer Information provides further information on **Micro Power Generation**, the submission, evaluation, and funding processes, proposal and proposal abstract formats, and other general information.

SECTION II: Broad Agency Announcement (BAA) 01-09 Micro Power Generation is a reprint of the BAA that was published in the *Commerce Business Daily* by the U. S. Government, Department of Commerce.

SECTION III: Defense Advanced Research Projects Agency/Microsystems Technology Office (DARPA/MTO) provides information on current programs within MTO.

Thank you for your interest in **BAA 01-09 Micro Power Generation**.

Sincerely,

William C. Tang, Ph.D.
Program Manager
DARPA/MTO

SECTION I: BAA 01-09 Proposer Information

This section provides further information on Micro Power Generation, the submission, evaluation, and funding processes, proposal and proposal abstract formats, and other general information.

The Defense Advanced Research Projects Agency (DARPA) often selects its research efforts through the Broad Agency Announcement (BAA) process. The BAA will appear first in the *Commerce Business Daily*, published by the U. S. Government, Department of Commerce. The following information is for those wishing to respond to the BAA.

The Defense Advanced Research Projects Agency (DARPA) is soliciting research proposals in the area of **Micro Power Generation (MPG)** devices to be used to power certain combinations of MicroElectroMechanical Systems (MEMS) -fabricated micro sensors, micro actuators, and/or electronic circuits. The final goal is to enable a standalone self-sustaining MPG with significantly superior power density compared to battery technology, which can be integrated with sensor and/or actuator packages with appropriate computing and communication capabilities. The key focus is on innovative MEMS solutions that clearly demonstrate optimization in MPG devices that takes into account several major factors affecting the overall efficiency and utility of the proposed devices. Examples of optimization factors include, but are not limited to: (1) the power requirement of the associated sensor, actuator, and/or electronic circuits, which typically range from tens of microwatts for sensor operations to less than a few hundred milliwatts for wireless data transmission; (2) thermal management if conversion of thermal energy is involved; (3) intake and exhaust managements if fluid or solid transports are required; (4) material compatibility and robustness if high-temperature and high-contact mechanical loads and/or mechanical outputs are parts of the design; and (5) energy storage and power distribution methodologies if there is a mismatch between the rates of energy conversion and energy consumption.

It is anticipated that the successful demonstration of collocating MPG with sensing, actuating, computing, and communication functions bears significant commercial value. However, selectable proposals are likely to be for research in MEMS solutions with clear and direct relevance to DoD systems and platforms. One such platform, as an example, is field-deployed distributed vibration micro sensor networks for detection of large-object ground movement. This platform requires sustained sensor operation and periodic wireless transmission of sensor data over a possible mission life of a few days to a few weeks. The MPG devices developed and demonstrated in this program are expected to meet these requirements. Other platforms may require direct replacement of batteries to significantly extend the operation time of small electronic devices that require milliwatts of sustaining power without increasing the size and weight of the final packages.

DARPA discourages proposals that focus solely on individual component development (e.g., micro valves, micro pumps, micro gears, micro combustion chambers, thermoelectric elements, etc.) or fabrication and materials research, although any of these subjects may very well be parts of a proposal that aims at demonstrating an optimized MPG device. Although desirable, collocation of the MPG device with a specific set of sensors, actuators, and/or electronics in the final demonstration is not a required option. However, selectable proposals must clearly demonstrate potentials for such collocation.

Teaming among academic, industrial and/or government partners is encouraged, and it is anticipated that the contributions of the team members are complementary as well as essential to the critical path of the research plan. A technology insertion plan is encouraged and research that holds promise of MEMS insertion into DoD relevance is of great interest.

SUBMISSION PROCESS

Proposers are strongly encouraged to submit a proposal abstract in advance of a full proposal. This procedure is intended to minimize unnecessary effort in proposal preparation and review. The time and date for submission of proposal abstracts is specified in the BAA. DARPA will acknowledge receipt of the submission and assign a control number that should be used in all further correspondence regarding the proposal abstract.

DARPA will respond to proposal abstracts with a recommendation to propose or not propose and the time and date for submission of a full proposal. DARPA will attempt to review proposal abstracts within thirty (30) calendar days after receipt and will allow proposers at least thirty (30) calendar days after review of their proposal abstracts in order to complete and submit their full proposals. Proposal abstracts will be reviewed as they are received. Early submissions of proposal abstracts and full proposals are strongly encouraged because selections may be made at any time during the evaluation process. Regardless of the recommendation, the decision to propose is the responsibility of the proposer. All submitted proposals will be fully reviewed regardless of the disposition of the proposal abstract. Proposers not submitting proposal abstracts are required to submit full proposals by the time and date specified in the BAA.

The typical proposal should express a consolidated effort in support of one or more related technical concepts or ideas. Disjoint efforts should not be included into a single proposal.

Restrictive notices notwithstanding, proposals may be handled, for administrative purposes only, by a support contractor. This support contractor is prohibited from competition in DARPA technical research in this program area and is bound by appropriate nondisclosure requirements. Proposals and proposal abstracts may not be submitted by fax or e-mail; any so sent will be disregarded.

Awards made under this BAA are subject to the provisions of the Federal Acquisition Regulation (FAR) Subpart 9.5, Organizational Conflict of Interest. All offerors and proposed subcontractors must affirmatively state whether they are providing scientific, engineering and technical assistance (SETA) or similar support to any DARPA technical office(s) through an active contract or subcontract. All affirmations must state which office(s) the offeror supports, and identify the prime contract number. Affirmations should be furnished at the time of proposal submission. All facts relevant to the existence or potential existence of organizational conflicts of interest, as that term is defined in the FAR 9.501, must be disclosed. The disclosure shall include a description of the action the offeror has taken, or proposes to take, to avoid, neutralize or mitigate such conflict.

EVALUATION CRITERIA/EVALUATION AND FUNDING PROCESSES

Proposals will not be evaluated against each other since they are not submitted in accordance with a common work statement. DARPA's intent is to review proposals as soon as possible after they arrive; however, proposals may be reviewed periodically for administrative reasons.

For evaluation purposes, a proposal is the two-volume document described in PROPOSAL FORMAT (see below). Other supporting or background materials submitted with the proposal will be considered for the reviewer's convenience only and not considered part of the proposal.

Evaluation of proposals will be accomplished through a technical review of each proposal using the following criteria, which are listed in descending order of relative importance:

(1) overall scientific and technical merit; (2) potential contribution and relevance to the DARPA mission; (3) plans and capability to accomplish technology transition; (4) offeror's capabilities and related experience; and (5) cost realism. Note: cost realism will only be significant in proposals that have significantly under or over-estimated the cost to complete their effort.

As soon as the proposal evaluation is completed, the proposer will be notified of selectability or non-selectability. Selectable proposals will be considered for funding; non-selectable proposals will be destroyed. (One copy of non-selectable proposals may be retained for file purposes.)

Not all proposals deemed selectable will be funded. Decisions to fund selectable proposals will be based on funds available, scientific and technical merit, and potential contribution and relevance to DARPA mission. Proposals may be considered for funding for a period of up to one year. The Government reserves the right to select for award all, some, or none of the proposals received. All responsible sources capable of satisfying the Government's needs may submit a proposal, which shall be considered by DARPA.

Proposals identified for funding may result in a procurement contract, grant, cooperative agreement, or other transaction depending upon the nature of the work proposed, the required degree of interaction between parties, and other factors. If warranted, portions of resulting awards may be segregated into pre-priced options.

PROPOSAL ABSTRACT FORMAT

Proposal abstracts are encouraged in advance of full proposals in order to provide potential offerors with a rapid response and to minimize unnecessary effort. Proposal abstracts should follow the same general format as described for Volume I under PROPOSAL FORMAT (see below), but include ONLY Sections I and II. The cover sheet should be clearly marked "PROPOSAL ABSTRACT" and the total length should not exceed fifteen (15) pages. All pages shall be printed on 8-1/2 by 11 inch paper with type not smaller than 12 point. The page limitation for proposal abstracts includes all figures, tables, and charts. No formal transmittal letter is required.

PROPOSAL FORMAT

All full proposals must be in the format given below. Nonconforming proposals may be rejected without review. Proposals shall consist of two volumes. All pages shall be printed on 8-1/2 by 11 inch paper with type not smaller than 12 point. The page limitation for full proposals includes all figures, tables, and charts. Volume I, Technical and Management Proposal, may include an attached bibliography of relevant technical papers or research notes (published and unpublished), which document the technical ideas and approach upon which the proposal is based. Copies of not more than three (3) relevant papers can be included with the submission. The bibliography and attached papers are not included in the page counts given below. The submission of other supporting materials along with the proposal is strongly discouraged and will not be considered for review. Except for the attached bibliography, Volume I shall not exceed fifty-four (54) pages. Maximum page lengths for each section are shown in braces { } below.

Volume I, Technical and Management Proposal

Section I. Administrative

A. {1} Cover sheet to include: (1) BAA number; (2) Lead Organization Submitting proposal; (3) Type of business, selected among the following categories: "LARGE BUSINESS", "SMALL DISADVANTAGED BUSINESS", "OTHER SMALL BUSINESS", "HBCU", "MI", "OTHER EDUCATIONAL", or "OTHER NONPROFIT"; (4) Contractor's reference number (if any); (5) Other team members (if applicable) and type of business for each; (6) Proposal title; (7) Technical point of contact to include: salutation, first name, last name, street address, city, state, zip code, telephone, fax (if available), electronic mail (if available); (8) Administrative point of contact to include: salutation, first name, last name, street address, city, state, zip code, telephone, fax (if available), electronic mail (if available), total funds requested from DARPA, and the amount of cost-share (if any); and (9) Date proposal was prepared.

B. {1} Official transmittal letter.

Section II. Summary of Proposal

This section provides an overview of the proposed work as well as an introduction to the associated technical and management issues. Further elaboration will be provided in Section III.

A. {3} Innovative claims for the proposed research. This section is the centerpiece of the proposal and should succinctly describe the uniqueness and benefits of the proposed approach relative to the current state-of-art and alternate approaches.

B. {3} Deliverables associated with the proposed research and the plans and capability to accomplish technology transition and commercialization. Include in this section all proprietary claims to results, prototypes, intellectual property, or systems supporting and/or necessary for the use of the research, results, and/or prototype. If there are no proprietary claims, this should be stated.

C. {1} Cost, schedule and milestones for the proposed research, including estimates of cost for each task in each year of the effort, total cost and company cost share.

D. {3} Technical rationale, technical approach, and constructive plan for accomplishment of technical goals in support of innovative claims and deliverable production. (In the full proposal, this section should be supplemented by a more detailed plan in Section III.)

E. {1} General discussion of other research in this area.

F. {2} A clearly defined organization chart for the program team which includes, as applicable: (1) the programmatic relationship of team members; (2) the unique capabilities of team members; (3) the task responsibilities of team members; (4) the teaming strategy among the team members; (5) the key personnel along with the amount of effort to be expended by each person during each year.

Section III. Detailed Proposal Information

This section provides the detailed discussion of the proposed work necessary to enable an in-depth review of the specific technical and managerial issues. Specific attention must be given to addressing both risk and payoff of the proposed work that make it desirable to DARPA.

A. {6} Statement of Work (SOW) written in plain English, outlining the scope of the effort and citing specific tasks to be performed and specific contractor requirements.

B. {4} Description of the results, products, transferable technology, and expected technology transfer path enhancing that of Section II.B.

C. {5} Detailed technical rationale enhancing that of Section II.

D. {5} Detailed technical approach enhancing and completing that of Section II.

E. {5} Comparison with other ongoing research indicating advantages and disadvantages of the proposed effort.

F. {3} Discussion of proposer's previous accomplishments and work in this or closely related research areas.

G. {2} Description of the facilities that would be used for the proposed effort.

H. {4} Detail support enhancing that of Section II, including formal teaming agreements that are required to execute this program.

I. {5} Cost schedule and milestones for the proposed research, including estimates of cost for each task in each year of the effort, total cost, and any company cost share. Where the effort consists of multiple portions that could reasonably be partitioned for purposes of funding, these should be identified as options with separate cost estimates for each.

Section IV. Additional Information

A brief bibliography of relevant technical papers and research notes (published and unpublished), which document the technical ideas upon which the proposal is based. Copies of not more than three (3) relevant papers can be included in the submission.

Volume II, Cost Proposal – {No page limit}

A. Cover sheet to include: (1) BAA number; (2) Lead Organization Submitting proposal; (3) Type of business, selected among the following categories: "LARGE BUSINESS", "SMALL DISADVANTAGED BUSINESS", "OTHER SMALL BUSINESS", "HBCU", "MI", "OTHER EDUCATIONAL", or "OTHER NONPROFIT"; (4) Contractor's reference number (if any); (5) Other team members (if applicable) and type of business for each; (6) Proposal title; (7) Technical point of contact to

include: salutation, first name, last name, street address, city, state, zip code, telephone, fax (if available), electronic mail (if available); (8) Administrative point of contact to include: salutation, first name, last name, street address, city, state, zip code, telephone, fax (if available), and electronic mail (if available); (9) Award instrument requested: cost-plus-fixed-fee (CPFF), cost-contract--no fee, cost sharing contract--no fee, or other type of procurement contract (*specify*), grant, cooperative agreement, or other transaction; (10) Place(s) and period(s) of performance; (11) Total proposed cost separated by basic award and option(s) (if any); (12) Name, address, and telephone number of the offeror's cognizant Defense Contract Management Command (DCMC) administration office (*if known*); (13) Name, address, and telephone number of the offeror's cognizant Defense Contract Audit Agency (DCAA) audit office (*if known*); and (14) Date proposal was prepared.

B. Detailed cost breakdown to include: (1) total program cost broken down by major cost items (direct labor, subcontracts, materials, other direct costs, overhead charges, etc.) and further broken down by year; (2) major program tasks by year; (3) an itemization of major subcontracts and equipment purchases; (4) an itemization of any information technology (IT)* purchases; (5) a summary of projected funding requirements by month; and (6) the source, nature, and amount of any industry cost-sharing. Where the effort consists of multiple portions that could reasonably be partitioned for purposes of funding, these should be identified as options with separate cost estimates for each.

C. Supporting cost and pricing information in sufficient detail to substantiate the summary cost estimates in B. above. Include a description of the method used to estimate costs and supporting documentation. Note: "cost or pricing data" as defined in FAR Subpart 15.401 shall be required if the offeror is seeking a procurement contract award of \$500,000 or greater unless the offeror requests an exception from the requirement to submit cost or pricing data. "Cost or pricing data" are not required if the offeror proposes an award instrument other than a procurement contract (e.g., a grant, cooperative agreement, or other transaction).

- IT is defined as "any equipment, or interconnected system(s) or subsystem(s) of equipment, that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the agency. (a) For purposes of this definition, equipment is used by an agency if the equipment is used by the agency directly or is used by a contractor under a contract with the agency which – (1) Requires the use of such equipment; or (2) Requires the use, to a significant extent, of such equipment in the performance of a service or the furnishing of a product. (b) The term "information technology" includes computers, ancillary, software, firmware and similar procedures, services (including support services), and related resources. (c) The term "information technology" does not include – (1) Any equipment that is acquired by a contractor incidental to a contract; or (2) Any equipment that contains imbedded information technology that is used as an integral part of the product, but the principal function of which is not the acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information. For example, HVAC (heating, ventilation, and air conditioning) equipment such as thermostats or temperature control devices, and medical equipment where information technology is integral to its operation, are not information technology."
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SECTION II: Reprint of Broad Agency Announcement 01-09 “Micro Power Generation” from the *Commerce Business Daily*, Publication Date: October 3, 2000; Issue No.: PSA-2698

Defense Advanced Research Projects Agency (DARPA), Contracts Management Office (CMO), 3701 North Fairfax Drive, Arlington, VA 22203-1714.

A – Micro Power Generation, SOL BAA 01-09 DUE 011601, POC William C. Tang, Ph.D., DARPA/MTO, FAX (703) 696-2206

PROGRAM OBJECTIVES AND DESCRIPTION

The Defense Advanced Research Projects Agency (DARPA) is soliciting research proposals in the area of Micro Power Generation. Proposed research should investigate innovative approaches that enable revolutionary advances in science, devices or systems. Specifically excluded is research that primarily results in evolutionary improvement to the existing state of practice.

The Defense Advanced Research Projects Agency (DARPA) is soliciting research proposals in the area of **Micro Power Generation (MPG)** devices to be used to power certain combinations of MicroElectroMechanical Systems (MEMS) -fabricated micro sensors, micro actuators, and/or electronic circuits. The final goal is to enable a standalone self-sustaining MPG with significantly superior power density compared to battery technology, which can be integrated with sensor and/or actuator packages with appropriate computing and communication capabilities. The key focus is on innovative MEMS solutions that clearly demonstrate optimization in MPG devices that takes into account several major factors affecting the overall efficiency and utility of the proposed devices. Examples of optimization factors include, but are not limited to: (1) the power requirement of the associated sensor, actuator, and/or electronic circuits, which typically range from tens of microwatts for sensor operations to less than a few hundred milliwatts for wireless data transmission; (2) thermal management if conversion of thermal energy is involved; (3) intake and exhaust managements if fluid or solid transports are required; (4) material compatibility and robustness if high-temperature and high-contact mechanical loads and/or mechanical outputs are parts of the design; and (5) energy storage and power distribution methodologies if there is a mismatch between the rates of energy conversion and energy consumption.

It is anticipated that the successful demonstration of collocating MPG with sensing, actuating, computing, and communication functions bears significant commercial value. However, selectable proposals are likely to be for research in MEMS solutions with clear and direct relevance to DoD systems and platforms. One such platform, as an example, is field-deployed distributed vibration micro sensor networks for detection of large-object ground movement. This platform requires sustained sensor operation and periodic wireless transmission of sensor data over a possible mission life of a few days to a few weeks. The MPG devices developed and demonstrated in this program are expected to meet these requirements. Other platforms may require direct replacement of batteries to significantly extend the operation time of small electronic devices that require milliwatts of sustaining power without increasing the size and weight of the final packages.

DARPA discourages proposals that focus solely on individual component development (e.g., micro valves, micro pumps, micro gears, micro combustion chambers, thermoelectric elements, etc.) or fabrication and materials research, although any of these subjects may very well be parts of a proposal that aims at demonstrating an optimized MPG device. Although desirable, collocation of the MPG device with a specific set of sensors, actuators, and/or electronics in the final demonstration is not a required option. However, selectable proposals must clearly demonstrate potentials for such collocation.

Teaming among academic, industrial and/or government partners is encouraged, and it is anticipated that the contributions of the team members are complementary as well as essential to the critical path of the research plan. A technology insertion plan is encouraged and research that holds promise of MEMS insertion into DoD relevance is of great interest.

PROGRAM SCOPE

Awards totaling approximately \$20 million over three years are expected to be made during the first half of calendar year 2001. Multiple awards are anticipated. Collaborative efforts/teaming and cost sharing are encouraged. The technical POC for this effort is William C. Tang, Ph.D., fax: (703) 696-2206, electronic mail: wtang@darpa.mil.

GENERAL INFORMATION

Proposers must obtain a pamphlet entitled "BAA 01-09, Micro Power Generation, Proposer Information Pamphlet" which provides further information on Micro Power Generation, the submission, evaluation, and funding processes, proposal abstract formats, proposal formats, and other general information. This pamphlet may be obtained from the World Wide Web (WWW) or by fax, electronic mail, or mail request to the administrative contact address given below. Proposals not meeting the format described in the pamphlet may not be reviewed. In order to minimize unnecessary effort in proposal preparation and review, proposers are strongly encouraged to submit proposal abstracts in advance of full proposals. An original and nine (9) copies of the proposal abstract must be submitted to DARPA/MTO, 3701 North Fairfax Drive, Arlington, VA 22203-1714 (Attn.: BAA 01-09) on or before 4:00 p.m., local time, Friday, December 1, 2000. Proposal abstracts received after this time and date may not be reviewed. Upon review, DARPA will provide written feedback on the likelihood of a full proposal being selected and the time and date for submission of a full proposal. Proposers not submitting proposal abstracts must submit an original and nine (9) copies of the full proposal to DARPA/MTO, 3701 North Fairfax Drive, Arlington, VA 22203-1714 (Attn.: BAA 01-09) on or before 4:00 p.m., local time, Tuesday, January 16, 2001, in order to be considered. This notice, in conjunction with the BAA 01-09 Proposer Information Pamphlet, constitutes the total BAA. No additional information is available, nor will a formal RFP or other solicitation regarding this announcement be issued. Requests for the same will be disregarded. The Government reserves the right to select for award all, some, or none of the proposals received. All responsible sources capable of satisfying the Government's needs may submit a proposal, which shall be considered by DARPA. Historically Black Colleges and Universities (HBCUs) and Minority Institutions (MIs) are encouraged to submit proposals and join others in submitting proposals; however, no portion of this BAA will be set aside for HBCU and MI participation due to the impracticality of reserving discrete or severable areas of research in micro power generation.

All administrative correspondence and questions on this solicitation, including requests for information on how to submit a proposal abstract or full proposal to this BAA, should be directed to one of the administrative addresses below; e-mail or fax is preferred. DARPA intends to use electronic mail and fax for correspondence regarding BAA 01-09. Proposals and proposal abstracts may not be submitted by fax or e-mail; any so sent will be

disregarded. DARPA encourages use of the WWW for retrieving the Proposer Information Pamphlet and any other related information that may subsequently be provided.

EVALUATION CRITERIA

Evaluation of proposal abstracts and full proposals will be accomplished through a technical review of each proposal using the following criteria, which are listed in descending order of relative importance: (1) overall scientific and technical merit, (2) potential contribution and relevance to DARPA mission, (3) plans and capability to accomplish technology transition, (4) offeror's capabilities and related experience, and (5) cost realism. Note: cost realism will only be significant in proposals that have significantly under or over-estimated the cost to complete their effort.

The administrative addresses for this BAA are:

Fax: (703) 351-8685 (Addressed to: DARPA/MTO, BAA 01-09),

Electronic Mail: BAA 01-09@darpa.mil

Mail: DARPA/MTO, ATTN: BAA 01-09
3701 North Fairfax Drive
Arlington, VA 22203-1714

This announcement and the Proposer Information Pamphlet may be retrieved via the WWW at URL <http://www.darpa.mil/> in the solicitations area.

SECTION III: Defense Advanced Research Projects Agency/Microsystems Technology Office (DARPA/MTO)

The Microsystems Technology Office (MTO) focuses on the heterogeneous microchip-scale integration of electronics, photonics, and microelectromechanical systems (MEMS) to produce a broad array of interface systems; sensors, sources, actuators, and displays; signal processors; and packaging and interconnect systems.

As information technologies continue to become more capable, more compact, and more affordable, they will increasingly pervade forward deployed and mobile military systems. These trends favor juxtaposing machine intelligence with interface systems that sense, source, display, and actuate. Manufacturing and affordability concerns pervade MTO programs. Addition detail can be found on the MTO office home page accessible from the WWW via URL <http://www.darpa.mil>.